

Claims

Sub a1 1. Pressurisable container for storing and ejecting liquid, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening
5 defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, ~~characterized in the improvement comprising,~~

10 that the front wall is substantially rigid in relation to the rear wall,
that the rear wall before pressurizing the container is substantially flat or substantially single-curved and

that the rear wall is deformable under stretching to substantially fill out the container cavity.

Q15 Sub a2 2. The container of claim 1, ~~characterized in that~~ ^{wherein} the cavity has the form of a generally concave deepening when seen from the rear wall side.

a 3. The container of claim 1, ~~characterized in that~~ ^{wherein} the cavity has little, and preferably no, undercut parts when seen from the rear side.

a 4. The container of claim 1, ~~characterized in that~~ ^{wherein} the front wall has a roughly
20 constant thickness when measured normal to the cavity surface towards the front wall.

Sub a2 5. The container of claim 1, ~~characterized in that~~ ^{at} the front wall has thickness, as measured normal to the cavity surface towards the front wall, increasing when moving away from the axis.

a 6. The container of claim 1, ~~characterized in that~~ ^{wherein} the front surface of the front
25 wall is substantially flat or substantially single-curved, at least in the area around the opening.

a 7. The container of claim 1, ~~characterized in that~~ ^{wherein} the rear surface of the front wall is substantially flat or substantially single-curved, at least in the area around the cavity.

Sub a3 8. The container of claim 1, ~~characterized in that~~ ^{at} the front and rear surfaces
30 of the front wall in the neighborhood of the cavity, but disregarding cavity and opening as such, are substantially parallel or concentric.

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9. The container of claim 8, characterized in that the front wall has the overall shape of a plate or cylinder part.

10. The container of claim 1, ^{wherein} ~~characterized in that~~ the opening duct has a cross-section which is one of roughly constant, roughly converging, roughly diverging or a combination thereof.

11. The container of claim 1, ^{wherein} ~~characterized in that~~ the opening is designed to assist in atomizing the liquid.

12. The container of claim 1, ^{wherein} ~~characterized in that~~ the opening is designed to assist in forming a coherent linear liquid stream.

13. The container of claim 1, ^{wherein} ~~characterized in that~~ the front wall front side has a cut-out area around the opening.

14. The container of claim 1, ^{wherein} ~~characterized in that~~ the container is connected to at least one other container to form a multiple container unit.

15. The container of claim 14, ^{wherein} ~~characterized in that~~ the front wall surface of several containers lies in the same flat or single-curved plane.

16. The container of claim 15, ^{wherein} ~~characterized in that~~ the front wall surfaces of several containers are covered by a single sheet material.

17. The container of claim 14, ^{wherein} ~~characterized in that~~ the rear wall surface of several containers lies in the same flat or single-curved plane.

18. The container of claim 17, ^{wherein} ~~characterized in that~~ the rear wall surfaces of several containers are covered by a single sheet material.

19. The container of claim 14, ^{wherein} ~~characterized in that~~ the unit is a substantially rigid and self-bearing structure.

20. The container of claim 19, ^{wherein} ~~characterized in that~~ the unit comprises an enlarged front wall structure in which several cavities with openings are provided to form the multiple containers.

21. The container of claim 20, ^{wherein} ~~characterized in that~~ the front and rear surfaces of the front wall structure are substantially parallel in the neighborhood of the cavities, when disregarding the cavities and openings as such, to give a general plate form.

22. The container of claim 21, ^{wherein} ~~characterized in that~~ the front wall structure has the overall shape of a disc.

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a 23. The container of claim 22, ^{wherein} ~~characterized in that~~ the several containers are positioned along at least one circle concentric with the disc periphery.

Suba7 24. The container of claim 20, ^{at} ~~characterized in that~~ the front and rear surfaces of the front wall structure are substantially single-curved and concentric in the neighborhood of the cavities, when disregarding the cavities and openings as such.

a 25. The container of claim 24, ^{wherein} ~~characterized in that~~ the front wall structure has the overall shape of a full or partial cylinder.

a 26. The container of claim 25, ^{wherein} ~~characterized in that~~ the several containers are positioned over two dimensions of the cylinder surface.

u 10 27. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall is folded in a continuous or discontinuous manner.

a 28. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall has substantially the same overall shape as the rear surface of the front wall.

a 29. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall is designed to be deformed elastically.

a 30. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall is designed to be deformed inelastically or permanently.

a 31. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall comprises a laminate.

20a 32. The container of claim 1, ^{wherein} ~~characterized in that~~ the rear wall comprises a metal layer.

a 33. The container of claim 1, ^{wherein} ~~characterized in that~~ a temporary sealing is provided over the opening.

a 34. The container of claim 33, ^{wherein} ~~characterized in that~~ the sealing is rupturable or removable.

a 35. The container of claim 33, ^{wherein} ~~characterized in that~~ the sealing comprises a flat or single-curved sheet.

Suba8 36. The container of claim 1, ^{at} ~~characterized in that~~ the liquid volume is less than 25 microliter, preferably less than 15 and most preferably less than 10 microliter.

30 37. The container of claim 1, ~~characterized in that~~ the opening diameter is between 10 and 1000 micron, preferably between 20 and 800 micron.

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38. The container of claim 1, characterized in that the front wall thickness is between 0,5 and 10 mm, preferably between 1 and 5 mm.

39. The container of claim 1, characterized in that the maximum cavity diameter is about 1 to 20 mm, preferably between 2 and 10 mm.

40. Pressurisable container for storing and ejecting liquid, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, characterized in the improvement comprising,

that in the vicinity of the cavity the front wall has the overall shape, except for the cavity itself, of a flat or single-curved plate with substantially parallel or concentric front and rear surfaces,

that at least a part of the cavity is formed between the front and rear surfaces with the opening exposed on the front surface and the open part of the vessel exposed on the rear surface, and

that the rear wall being attached to the rear surface.

41. The container of claim 40, characterized in any characteristic of claims 1 to 39.

42. Pressurisable container for storing and ejecting liquid, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, characterized in the improvement comprising,

that the front wall thickness, as measured along lines running through the cavity and normal to the vessel closed surface, increases when moving off-set from the container axis.

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43. The container of claim 42, characterized in any characteristic of claims 1 to 39.

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44. A method for manufacture of a container containing liquid, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, characterized in the steps of,

forming a front wall with a cavity in the form of a vessel with an opening connecting the vessel with the front wall front surface,

introducing liquid into the vessel cavity, and

attaching and adhering a flat or single-curved rear wall film to the vessel cavity open part to enclose the liquid in the container.

45. The method of claim 44, characterized in the step of forming the front wall with cavity and opening by injection molding.

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46. The method of claim 44, characterized in the step of adhering the rear wall film by welding.

47. The method of claim 46, characterized in the step of welding by heat.

48. The method of claim 44, characterized in the step of adhering a flat or single-curved sealing film over the opening.

49. The method of claim 44, characterized in the step of forming a front wall with more than one cavity.

50. The method of claim 49, characterized in the step of adhering the rear wall film over more than one cavity.

51. The method of claim 49, characterized in the step of adhering a flat or single-curved film over more than one cavity.

52. The method of claim 44, characterized in that the container has any of the characteristics of claims 1 to 39.

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53. A container containing liquid, characterized in that it is manufactured according to the method of any of claims 44 to 53.

54. A method for ejecting liquid from a container, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, characterized in the steps of,

pressurizing the container by moving the rear wall at least partially in the axial direction and towards the opening with sufficient speed to eject liquid through the opening and hereunder stretching the rear wall, elastically or inelastically, to increase its surface.

55. The method of claim 54, ^{wherein} characterized in that the stretching step comprises the step of stretching the rear wall from a flat or single-curved form into a double-curved form.

56. The method of claim 54, characterized in that the stretching step comprises the step of deforming the rear wall until substantially corresponding to the cavity form.

57. The method of claim 54, characterized in the step of substantially evacuating the liquid of the container.

58. The method of claim 54, characterized in that the liquid is ejected from the opening with a speed of at least 5, preferably at least 10 m/s.

59. The method of claim 54, ^{wherein} characterized in that the liquid is ejected in the form of droplets of a diameter less than about 20 micron.

60. The method of claim 54, ^{wherein} characterized in that the liquid is ejected in the form of a coherent jet.

61. The method of claim 54, ^{wherein} characterized in that the liquid is allowed to pass through air a distance not less than 1 cm before hitting a target surface.

62. The method of claim 54, ^{wherein} characterized in that the liquid is allowed to hit an eye.

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63. The method of claim 54, ^{wherein} ~~characterized in that~~ the liquid is allowed to hit a soft surface for at least partial penetration thereof.

64. A device for ejecting liquid from a container, the container comprising a) a front wall having or surrounding a cavity corresponding to the form of an open vessel, b) an opening in the front wall adapted for ejection of the liquid from the container, said opening defining a container axis, c) optionally a sealing over the opening adapted for temporary use, and d) a rear wall closing and sealing the open part of the front wall vessel to confine a space for the liquid in the container, the rear wall running at least partially perpendicular to the container axis and being displaceable or deformable for movement towards the opening to pressurize the container liquid, ~~characterized in the improvement comprising,~~

a housing with a seat for the container adapted to receive a container having a distance between rear wall and front wall front surface of at least 0,5 mm,

a ram arranged in a moving direction, in relation to the housing, substantially axial to the container when in the seat,

an actuator operative to drive the ram.

65. The device of claim 64, ~~characterized in that~~ the container when in the seat exposes substantially the whole part of the rear wall surface covering the cavity towards the ram.

66. The device of claim 64, ^{wherein} ~~characterized in that~~ the seat is arranged to allow exchange of containers in the seat.

67. The device of claim 66, ^{wherein} ~~characterized in that~~ the seat is arranged to allow exchange by sequential feeding of containers in a multiple container unit into the seat.

68. The device of claim 67, ^{wherein} ~~characterized in that~~ the seat comprises a track in which the containers can be fed.

69. The device of claim 67, ^{wherein} ~~characterized in that~~ the seat allows sequential feeding by rotation of a multiple container unit having containers arranged in a circle pattern.

70. The device of claim 64, ^{further comprising} ~~characterized in that~~ a guiding arrangement arranged to secure alignment between the ram and the container cavity.

71. The device of claim 70, ^{wherein} ~~characterized in that~~ the guiding arrangement comprises a releasable lock between the container and the housing or seat.

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72. The device of claim 70, ^{wherein} ~~characterized in that~~ the guiding arrangement comprises a releasable lock between the container and the ram.

73. The device of claim 72, ^{wherein} ~~characterized in that~~ the locking arrangement comprises a structure locking the container when moved in the moving direction of the ram.

74. The device of claim 64, ^{wherein} ~~characterized in that~~ the ram comprises a ram head and a ram piston.

75. The device of claim 74, ^{wherein} ~~characterized in that~~ the front part of the ram head substantially conforms with the container cavity.

76. The device of claim 74, ^{wherein} ~~characterized in that~~ at least the ram head front part is made of a soft material adaptable to the container cavity.

77. The device of claim 74, ^{wherein} ~~characterized in that~~ the actuator is arranged to displace the ram piston.

78. The device of claim 64, ^{wherein} ~~characterized in that~~ the actuator comprises an electrical arrangement for driving the ram.

79. The device of claim 64, ^{wherein} ~~characterized in that~~ the actuator comprises a mechanical arrangement for driving the ram.

80. The device of claim 79, ^{wherein} ~~characterized in that~~ the mechanical arrangement comprises at least one spring for energy storage.

81. The device of claim 64, ^{wherein} ~~characterized in that~~ the actuator comprises a transmission including at least one driving force transforming arrangement.

82. The device of claim 81, ^{wherein} ~~characterized in that~~ the transmission includes a screw and nut arrangement.

83. The device of claim 64, ^{further comprising} ~~characterized in that~~ a damper arranged to affect the ram movement.

84. The device of claim 64, ^{further comprising} ~~characterized in that~~ a de-sealing tool arranged for breakage or removal of a sealing over the container opening.

85. The device of claim 84, ^{wherein} ~~characterized in that~~ the tool is arranged to the rear of the container when in the seat and arranged for forward movement during de-sealing.

86. The device of claim 85, ^{wherein} ~~characterized in that~~ the tool is arranged to pass through or past the front wall during its forward movement to attack the sealing.

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a 87. The device of claim 86, ^{wherein} ~~characterized in~~ that the tool and container are arranged to cooperate as a guiding arrangement arranged to secure alignment between the ram and the container cavity.

a 5 88. The device of claim 85, ^{wherein} ~~characterized in~~ that the tool is connected to the ram for common movement therewith.

a 89. The device of claim 88, ^{wherein} ~~characterized in~~ that the tool is connected to the ram so as to hit the sealing before the ram hits the container.

90. The device of claim 64, ~~characterized in~~ that the container is any of the containers of claims 1 to 39.

10 91. The device of claim 64, ~~characterized in~~ arranged to enable ejection of liquid in accordance with any of claims 54 to 63.

^{insert all} 92. A kit or combination ~~characterized in~~ that it comprises a) a container according to any of claims 1 to 39 and ^{all} b) a device having a ram arranged to displace or deform the container rear wall to pressurize the container liquid.

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